computation with a robust and simple instrument. By acquiring a scanned series of mixed spectral images, which can result from the claimed maintenance of concurrent optical paths, and then deriving pure spectral images from them, systems according to the invention can be made with few moving parts or more robust mechanisms than prior art systems. This is because they can be made using a simple variable optical filter in place of more costly interferometers, or active variable filters such as liquid crystal tunable filters (LCTF). The resulting systems can therefore be less expensive and more reliable.

Claim 1 stands rejected under 23 U.S.C. § 103(a) over Lewis et al. in view of Richard. The office action argues that Lewis et al. disclose a spatial detector and a variable filter, and although Lewis et al. do not disclose a linear actuator, it would have been obvious to one of ordinary skill in the art to replace the Lewis et al. AOTF with a linear actuator and filters from the Richard patent to obtain the invention as now claimed.

But nothing in the prior art of record discloses or suggests the invention as now claimed in amended claim 1. Specifically, Lewis et al. employ an acousto-optic tunable filter (AOTF), which is an electronically tunable spectral bandpass filter (col. 7, lines 67-68) that is used to filter collimated light at a selected wavelength. The wavelength, or range of wavelengths, is selected by the user under computer control (col. 8, lines 62-65). But nowhere do Lewis et al. disclose or suggest that their AOTF should have wavelength response characteristics that vary in one spatial direction, or that there should be concurrent optical paths from the sample area to the spatial detector that pass through different portions of the variable filter having different wavelength response characteristics, as now claimed in amended claim 1.

Nor is there any evidence that it would have been obvious to replace the Lewis et al. AOTF with Richard's filters and linear actuator. Indeed, Lewis et al. specifically state that wide field illumination methods suffer from constraints of moving mechanical parts, which limit the speed and reliability of these systems (col. 4, lines 4-7). They go on to note that it is an object of their invention to provide a solid-state spectroscopic imaging device that contains no moving parts (col. 4, lines 42-44). One of ordinary skill in the art would thus not be motivated to add a linear actuator from the Richard selection device to the Lewis et al. spectroscopic imaging device.

And even if the proposed combination had been made, it still would not have disclosed or suggested the invention as now claimed, because neither patent discloses or suggests a linear actuator that is operative to move a variable filter relative to a spatial detector along the spatial direction in which the wavelength response characteristics vary, while maintaining at least some

concurrent optical paths from the sample area to the spatial detector that pass through different portions of the variable filter having different wavelength response characteristics, as now claimed in amended claim 1. Only from hindsight would such a teaching be apparent.

Claims 22, 39, and 58 as now amended distinguish over the prior art of record for at least similar reasons to those advanced in support of claim 1, and the remaining claims should be allowable for at least the reason that they depend on an allowable claim.

Claims 124-170 are new, and their examination is respectfully requested. Apparatus claim 11 has been amended to eliminate step-based language, and its examination in its amended form is also respectfully requested.

This application should now be in condition for allowance, and such action is respectfully requested. Should further questions arise concerning this application, the Examiner is invited to call Applicants' representative at the number listed below. The Commissioner is hereby authorized to charge any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0750.

July 29, 2003
Dated

Respectfully submitted,

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Marked-Up Version to Show Changes Made

1. (Amended) An imaging optical instrument for acquiring images of a sample area, comprising:

a spatial detector including a plurality of aligned detector elements,

a variable filter having ~~filter~~wavelength response characteristics that vary in at least one spatial direction,~~wherein there is an optical path from the variable filter to the spatial detector,~~ and

an actuator operatively connected between the variable filter and the spatial detector and operative to move the variable filter relative to the spatial detector along the spatial direction in which the ~~filter~~wavelength response characteristics ~~vary.~~
vary, while maintaining at least some concurrent optical paths from the sample area to the spatial detector that pass through different portions of the variable filter having different wavelength response characteristics.

11. (Amended) The apparatus of claim 1 further including ~~the step of~~means for shifting acquired data on a line-by-line basis as it is being acquired.

22. (Amended) An optical spectroscopic method, comprising:

filtering a plurality of radiation beam portions for different positions in a sample area with a plurality of portions of a filter each having different ~~filter characteristics and being located~~wavelength response characteristics, with the filter at a first position,

detecting the plurality of radiation beam portions with different parts of a spatial detector after filtering the radiation beam portions in the step of filtering,

moving the filter to a second position relative to a detector used in the step of detecting,

again filtering the plurality of radiation beam portions with a plurality of portions of the filter each having different wavelength response characteristics, with the filter at the second position,

again detecting the plurality of radiation beam portions with different parts of a spatial detector after filtering the radiation beam portions in the step of again filtering, and

deriving spectral information from data acquired in the steps of detecting and again detecting.

39. <u>(Amended)</u> A two-dimensional imaging optical instrument for acquiring images of a two-dimensional sample area irradiated by a source, comprising:

a two-dimensional spatial detector having detector elements aligned along a first axis and a second axis,

a two-dimensional variable filter having filter characteristics that vary in at least one dimension, wherein there is an optical path from the variable filter to the spatial detector, and

<u>an optic operative to image radiation that has interacted with the whole surface of the sample area onto the spatial detector through a plurality of portions of the variable filter having different wavelength response characteristics, and</u>

an actuator operatively connected to at least one of the source, the <u>optic, the</u> variable filter, the sample and the spatial detector, and operative to move at least the one of these elements with respect to at least another of these elements, <u>while the optic images the radiation that has interacted with the whole surface of the sample area onto the spatial detector through a plurality of portions of the variable filter having different wavelength response characteristics, and</u> wherein the actuator is driven by the instrument to enable detection of a predetermined sample area by a predetermined spatial detector area at a predetermined time.

58. <u>(Amended)</u> An optical spectroscopic method, comprising:

filtering a plurality of radiation beam portions for a first set of different positions in a sample area with different ~~filter characteristics,~~<u>wavelength response characteristics at different spatial positions,</u>

detecting the plurality of radiation beam portions with different parts of a spatial detector after filtering the radiation beam portions in the first step,

successively filtering further pluralities of radiation beam portions for further sets of different positions in the sample area with the same ~~filter~~<u>wavelength response</u> characteristics <u>at the same spatial positions</u> after the steps of filtering and detecting, wherein the further sets of positions are different from the first set and from each other, and

successively detecting the further pluralities of radiation beam portions with different parts of a spatial detector after filtering the further pluralities of radiation beam portions, and

deriving spectral information about predetermined positions in the sample from data acquired in the steps of detecting and successively detecting.